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Anxiety and Depression in Marines Sent to War in Iraq and Afghanistan

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Abstract: Although the effects of combat deployment on posttraumatic stress disorder have been extensively studied, little is known about the effects of combat deployment on depression and anxiety. This study examined the factors associated with anxiety and depression in a sample of 1560 US Marines who were deployed to Iraq and Afghanistan. Eleven demographic and psychosocial factors were studied in relation to depression and anxiety. Five factors emerged as significant in relation to depression: deployment-related stressors, combat exposure, attitudes toward leadership, mild traumatic brain injury symptoms, and marital status. The same factors, with the exception of marital status, emerged as significant in relation to anxiety. Deployment-related stressors had a stronger association with both depression and anxiety than any other variable, including combat exposure. This finding is important because deployment-related stressors are potentially modifiable by the military.

Key Words: Anxiety, depression, psychiatric disorders, military populations, Marines, Iraq/Afghanistan wars, veterans, combat, deployment stressors

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Substantial evidence suggests that participation in combat operations is associated with an increased risk for mental health disorders. Posttraumatic stress disorder (PTSD) is the disorder most clearly linked with combat exposure (Dohrenwend et al., 2007; Hoge et al., 2004; Larson et al., 2008), but combat exposure may also lead to elevated rates of anxiety and depression. Although the effects of combat deployment on PTSD have been extensively studied, little is known about the effects of combat deployment on depression and anxiety.

As in community populations, depression and anxiety are common and significant problems in military populations (Iversen et al., 2005; Wells et al., 2010). Despite the known prevalence of depression and anxiety and the significant impairment associated with these problems, only a handful of studies have investigated depression and anxiety among military service members who have deployed to combat. A study by Fiedler et al. (2006) found that military deployment to the Gulf War was associated with elevated rates of psychiatric diagnoses, with twice the prevalence of anxiety disorders and depression. Hoge et al. (2004) reported that US military members assessed after return-

ing from combat deployment to Iraq and Afghanistan had higher rates of depression and anxiety compared with a sample of military members who were assessed before deployment. A study of US military members from multiple branches (Wells et al., 2010) found that deployment with combat exposure was a risk factor for new-onset depression. A cross-sectional study of a large Canadian military sample (Sareen et al., 2007) found a link between combat exposure and mental health problems, including depression and PTSD.

Given the significant disability and functional impairment associated with anxiety and depression (Hoffman et al., 2008; Kessler et al., 2003; Wells et al., 1989) and the fact that these disorders may be comorbid with PTSD (Brown et al., 2001; Miller et al., 2008), it is important that factors associated with anxiety and depression be identified among military personnel deployed to combat. Identification of factors associated with elevated rates of anxiety and depression could lead to policy changes, training, and other interventions designed to reduce the harmful psychological effects of combat on military personnel.

Factors that make deployed military members vulnerable to depression and anxiety are not well understood. Although few studies have examined psychosocial and military factors in relation to depression and anxiety, variables that past research suggests might play a role in risk for depression and anxiety include degree of combat exposure, deployment-related stressors, mild traumatic brain injury (TBI), attitudes toward leadership, and active versus reserve status (Adler et al., 1996; Castro and McGurk, 2007; Dohrenwend et al., 2007; Engelhard and van den Hout, 2007; Hoge et al., 2008; Milliken et al., 2007).

Based on past research, it seems reasonable to expect combat exposure to be associated with depression and anxiety. However, most studies investigating combat exposure have studied this variable in relation to PTSD, not depression or anxiety. Numerous studies have found significant dose-response associations between degree of combat exposure and PTSD. This combat-PTSD association has been found in research with Vietnam veterans (Dohrenwend et al., 2007; Fontana and Rosenheck, 1999; Koenen et al., 2003) and Gulf War veterans (Adler et al., 1996; Southwick et al., 1995; Wolfe et al., 1993) and in studies of combatants from Operation Enduring Freedom (OEF) and Operation Iraq Freedom (OIF) (Iversen et al., 2008; Smith et al., 2008). Very few studies of contemporary combatants have examined combat exposure in relation to depression or anxiety (for exceptions, see Maguen et al., 2010; Wells et al., 2010).

Although it seems reasonable to expect combat exposure to be linked with depression and anxiety, there are strong reasons to believe that factors other than combat exposure may be equally important as risk factors for these disorders. One factor that may be as important as combat as a predictor of depression and anxiety in military personnel is general deployment-related stressors (Bartone et al., 1998; Booth-Kewley et al., 2010; King et al., 1995; Litz et al., 1997). Noncombat deployment stressors have been labeled in various ways, including deployment-related stressors, operational stressors, low-magnitude stressors, general overseas stressors, contextual stressors, and malevolent environment (Engelhard and van den Hout, 2007; King et al., 1995; Litz et al., 1997). Examples of these stressors include

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concerns or problems with family members back home, problems with supervisors, excessive heat and cold, inadequate supplies or equipment, lack of privacy, and boredom.

A number of studies have found an association between deployment-related stressors and PTSD. This association has been demonstrated in Vietnam veterans (Fontana and Rosenheck, 1999; King et al., 1995) and Gulf War veterans (Vogt et al., 2005). However, the link between deployment-related stressors and PTSD has rarely been studied among OEF/OIF combatants (Booth-Kewley et al., 2010; Engelhard and van den Hout, 2007). Moreover, no study, to our knowledge, has examined deployment-related stressors in relation to depression and anxiety among OEF/OIF combatants. Most research on the link between deployment-related stressors and mental health has not controlled for combat exposure (for two exceptions, see King et al., 1995; Vogt et al., 2005). In addition, we are not aware of any studies that have examined deployment-related stressors in relation to depression and anxiety, adjusting for combat exposure. This was a goal of the current study.

A key psychosocial variable that may have an important impact on depression and anxiety is leadership. Perceptions of supportive leadership are associated with greater willingness of members to stay with their unit, greater satisfaction with the military, and higher morale (Griffith, 1988). A recent study of Army soldiers deployed to Iraq identified positive attitudes toward leadership as a key factor contributing to soldiers' well-being and resilience (Mental Health Advisory Team [MHAT], 2009). A study of combat-deployed US soldiers and Marines (Castro and McGurk, 2007) found that those who gave positive ratings of their leaders were less likely to screen positive for a mental health problem than were those who gave negative ratings. Other Army research has suggested that positive leadership can substantially reduce the negative effects of stress experienced by deployed military personnel (Britt et al., 2004). Civilian research (Fisher 1985; Karasek et al., 1982) also supports the idea that good leadership can act as an important stress buffer.

An additional factor that may be linked to depression and anxiety among military combatants is active duty versus reserve status. Anecdotally, it has been suggested for a variety of reasons that reservists may be at greater risk than active-duty personnel for mental health problems after combat deployment. These reasons include reservists reentering society without the day-to-day support of military comrades, the fact that combat deployment may be more disruptive to the home life of reservists, and the fact that reservists typically return immediately to civilian employment after deployment, which means they have the added stress of having to shift from a military environment to civilian employment (Griffith, 2010; Milliken et al., 2007; Renshaw et al., 2009). Although there is some evidence that reservists who deploy to combat have more mental disorders than their active-duty counterparts do (Browne et al., 2007; Griffith, 2010; Milliken et al., 2007; Wolfe et al., 1999), some studies have found no difference (MHAT, 2008; Vogt et al., 2008).

Another possible risk factor for depression and anxiety among combatants is mild TBI symptoms. Although the nature of the relationship between mild TBI symptoms and mental disorders is unclear, there is clear empirical overlap between symptoms of mild TBI and symptoms of PTSD (Hoge et al., 2008; Kennedy et al., 2007; Schneiderman et al., 2008). A recent records-based study of Iraq and Afghanistan war veterans (Carlson et al., 2010) found that those who screened positive for TBI had significantly higher rates of PTSD, depression, anxiety, and other disorders. More research is needed to determine the association between TBI symptoms and depression and anxiety among OEF/OIF combatants.

Because depression and anxiety have rarely been studied among current combatants, the overall objective of this study was to identify factors associated with depression and anxiety in a sample of 1560 Marines who deployed to combat zones in Iraq and Afghanistan. A

specific objective was to examine deployment-related stressors in relation to depression and anxiety, controlling for combat exposure.

METHODS

Participants

The study population consisted of 1560 enlisted and officer Marines who had completed at least one war-zone deployment (in Iraq and/or Afghanistan). Most participants (95%) had been deployed to Iraq. Participants were drawn from US military bases located in Southern California ($n = 848$) and Okinawa, Japan ($n = 712$). The US Marines surveyed were assigned to a wide variety of units, including the 1st Marine Regiment (Camp Pendleton, California), 4th Marine Regiment (Camp Schwab, Okinawa), 7th Engineer Support Battalion (Camp Pendleton), and 9th Engineer Support Battalion (Camp Hansen, Okinawa). Participants came from a wide range of military occupations; the most common were infantry (15%), communications (13%), and motor transport (12%).

Every participant in the sample had been deployed to a combat zone between 2002 and 2007. Specifically, every participant had deployed to either Iraq or Afghanistan during this time frame. Most (94%) had completed their most recent combat deployment between January 2004 and December 2007. Fifty-four percent of the participants had completed one combat deployment, 28.6% had completed two deployments, and 17.4% had completed three or more. Participants were asked to answer all survey questions with regard to their most recent combat deployment.

Measures

The outcome variables used in this study were depression and anxiety; they were measured using self-report scales.

Depression

Depression was measured using the 10-item Center for Epidemiologic Studies Depression Scale (CES-D-10) (Andresen et al., 1994). The CES-D-10 is a subset of the full 20-item CES-D Scale (Radloff, 1977), and it has been used extensively in past research (e.g., Brown et al., 2005; Yi et al., 2006). Respondents rate each item on a 0 to 3-point response scale indicating how often they have felt each symptom of depression during the past week. Total scale scores (summed across all 10 items) can range from 0 to 30. The CES-D-10 has similar psychometric properties compared with those of the original measure (Andresen et al., 1994; Zauszniewski and Graham, 2009). Consistent with previous research, respondents were classified as screening positive for depression if they obtained a score of 10 or higher. The scale's coefficient alpha for the present sample was 0.80.

Anxiety

Anxiety was assessed using the seven-item anxiety scale used in the Department of Defense Survey of Health Related Behaviors Among Active Duty Military Personnel (Bray et al., 2006). This anxiety scale was adapted from the anxiety module of the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (Spitzer et al., 1999). For each item, respondents indicate how often they were bothered by each problem or symptom in the past 30 days, with response options ranging from "not at all" to "more than half of the days." Following procedures used by Bray et al. (2006), if respondents indicated that they had been feeling nervous, anxious, or on edge or had been worrying a lot about different things for several days or more (the first item in the set), the analysis then examined whether they reported any of the other six anxiety symptoms. If respondents reported three or more of the other six anxiety symptoms on more than half of the days, they were classified as screening positive for anxiety.

The variables that were selected for investigation in relation to anxiety and depression were chosen on the basis of past empirical research as well as theory. These variables, and the procedures used to measure them, are described below.

Combat Exposures

A combat exposure scale was adapted from the Army MHAT (2008) combat exposure scale. The combat exposure scale was similar to combat exposure measures used in other military research (Adler et al., 1996; Iversen et al., 2008). The scale consisted of 16 items assessing experiences, such as “receiving incoming artillery, rocket, or mortar fire” and “knowing someone seriously injured or killed.” Participants were asked to indicate how often they experienced each combat stressor using a 5-point scale (1 = never to 5 = ≥ 10 times). An overall combat exposure score was created by summing across all scale items ($\alpha = 0.92$). Level of combat exposure was classified into four categories (low, medium, high, and very high) based on the quartile distribution of the combat exposure scale scores.

Deployment-Related Stressors

Deployment-related stressors were assessed using a scale developed by Army researchers (MHAT, 2008). This scale consisted of 11 questions about stressors that service members might experience during deployment, such as “concerns or problems back home,” “problems with supervisor(s) or chain of command,” and “lack of time off.” Respondents were asked how much trouble or concern was caused by each deployment stressor (1 = very low concern to 5 = very high concern). An overall deployment-related stressor score was created by summing across all scale items ($\alpha = 0.88$). Deployment stressor level was classified into four groups (low, medium, high, and very high) based on the quartile distribution of the scale scores.

Attitudes Toward Leadership

Attitudes toward leadership were assessed using an eight-item scale that assessed attitudes toward enlisted and officer leadership during the respondents' most recent deployment. This scale was adapted from the leadership items on the Army's MHAT survey (Castro and McGurk, 2007; MHAT, 2008). Four items asked about senior enlisted leadership; a parallel set of four items asked about officer leadership. Because the leadership attitude scale was constructed by summing responses to all eight items, this scale combined attitudes toward senior enlisted leadership and attitudes toward officer leadership. Specifically, the scale was made up of the following items: “In your unit, how often do officers (or senior enlisted): (1) tell unit members when they have done a good job, (2) exhibit clear thinking and reasonable action under stress, (3) treat all members of the unit fairly, and (4) express concern about the safety of unit members.” An overall attitudes toward leadership scale score was created by summing across all items ($\alpha = 0.90$). Attitudes toward leadership was classified into three groups (low, medium, and high) based on the tertile distribution of the scale scores.

Mild TBI Symptoms

Mild TBI symptoms were assessed using a set of questions that asked participants whether they had received an injury to the head during their most recent deployment that involved “being dazed, confused, or ‘seeing stars’” or “not remembering the injury, or losing consciousness (knocked out).” A participant was classified as having a positive TBI screen if any of the three questions elicited a positive response. Hoge et al. (2008) used this procedure in their study of mild TBI among soldiers returning from Iraq. The questions were based on definitions from the Centers for Disease Control and Prevention and

the World Health Organization that were adapted by the Defense and Veterans Brain Injury Center working group for military use.

Demographic and Military Background Variables

The questionnaire asked for the following demographic and military information: sex, age, marital status, rank/pay grade, military occupational specialty (job or occupation), education level, ethnic background, and active versus reserve status. Participants were also asked to provide the dates and locations of their combat deployments.

Procedure

We invited military personnel at the US Marine Corps bases located in Southern California and Okinawa, Japan, to participate in the study. Participation was voluntary, and military unit commanders were not present during enrollment or questionnaire completion. Study enrollment and survey administration were performed by civilian researchers. To be eligible for participation, respondents had to be members of the Marine Corps and had to have completed at least one combat deployment. Each participant was given a small gift (a \$5.00 fast-food gift card or a computer flash drive of comparable value) in exchange for participation. The overall response rate was 78%.

Participants were asked to complete a 30-minute questionnaire called the Warfighter Status Survey. After receiving an explanation of the study aims and procedures, all participants gave written informed consent before participation. The questionnaire was administered to participants in group settings at military bases located in Southern California and Okinawa, Japan. Questionnaires were completed between June 2007 and January 2008.

To allow for a possible follow-up assessment, participants were asked to provide their social security numbers and names. Potential participants were assured that all data would be kept completely confidential and no one in their chain of command would see their data. All research procedures were approved by the Naval Health Research Center Institutional Review Board.

Statistical Analysis

Univariate and multivariate logistic regressions were used to assess the associations between the exposure variables and screening positive for depression and anxiety. In some cases, item-level analyses were also conducted. The following demographic characteristics were included as covariates in the multivariate logistic regression models: age (18–21, 22–26, or ≥ 27 years), education level (high school or less versus some college/college degree), race (white or nonwhite), marital status (never married, married, or divorced), number of deployments (one deployment or two or more deployments), months since last deployment (time interval between end of deployment and study participation; ≤ 5 , 6–14, or > 14 months), and active duty versus reserve status. Regression diagnostics did not reveal any substantial collinearities among the variables, either in the dichotomous or categorical forms in which they were used in the analyses, or in their original continuous form.

To simplify presentation of results and to aid in interpretation, many of the continuous or ordinal variables (e.g., age, combat exposure, attitudes toward leadership) were presented as dichotomous variables, or as tertiles or quartiles. This allowed the odds ratios (ORs) to be interpreted in a simple and direct way.

Statistical significance was set at $p < 0.05$ (two sided) for all analyses. Statistical analyses were performed using SPSS for Windows, version 16 (SPSS Inc, Chicago, IL).

RESULTS

The demographic characteristics of the participants are shown in Table 1. The participants were primarily male, and the main ethnic

TABLE 1. Demographic Characteristics of Study Participants (Marines Deployed to Combat, 2002–2007; *N* = 1560)

Demographic Characteristic	<i>N</i>	%
Sex		
Male	1480	94.9
Female	80	5.1
Race/ethnicity		
White, non-Hispanic	900	57.7
Black, non-Hispanic	176	11.3
Hispanic	348	22.3
Other	136	8.7
Education		
High school or less	751	48.1
Some college or college degree	809	51.9
Age, yrs		
18–21	590	37.8
22–26	487	31.2
≥27	483	31.0
Marital status		
Never married	727	46.6
Married	717	46.0
Divorced	116	7.4
Pay grade/rank		
Enlisted		
E1–E3	372	23.8
E4–E6	894	57.3
E7–E9	155	9.9
Warrant officer		
W1–W5	37	2.4
Officer		
O1–O3	77	4.9
O4–O6	25	1.6
Active or reserve		
Active	1,303	83.5
Reserve	257	16.5
Combat deployments		
One	842	54.0
Two	446	28.6
Three or more	272	17.4

Because of rounding, percentages may not sum to 100.

groups were white and Hispanic. About half the sample had a high school diploma or equivalency degree or a lower level of education; the other half had some college or a college degree. More than a third of the participants were 21 years or younger. The most common pay grades were E4–E6. About half of the participants were married. The study participants were similar to the Marine Corps population on demographics, except that Hispanic personnel were overrepresented among the participants and Marines in the lowest pay grade categories (E1–E3) were somewhat underrepresented in the study sample.

A total of 402 respondents (25.8%) screened positive for depression, and 175 respondents (11.2%) screened positive for anxiety. In this sample, the tetrachoric correlation (used with binary variables) between screening positive for depression and screening positive for anxiety was 0.44 ($p < 0.01$). (The correlation between the continuous depression and anxiety measures was 0.67, $p < 0.01$.)

Depression

The results of the univariate and multivariate logistic regression of the demographic and psychosocial variables in relation to depression are shown in Table 2. In the univariate analysis, eight variables had significant associations with depression: combat exposure, deployment-related stressors, attitudes toward leadership, screening positive for mild TBI, age, education, marital status, and months since last deployment.

In the multivariate analysis, five variables were significantly associated with depression: combat exposure, deployment-related stressors, attitudes toward leadership, screening positive for mild TBI, and marital status (divorced or never married).

The variable with the strongest association with depression by far was deployment-related stressors. With all other variables controlled, Marines in the highest quartile of deployment-related stressors were more than five and a half times as likely (OR, 5.56) to screen positive for depression as Marines in the lowest quartile.

Combat exposure was also significantly associated with depression in the multivariate model. Although Marines in the top quartile of combat exposure (very high combat exposure) were more likely to be depressed than Marines in the lowest (low combat exposure) quartile, this effect (OR, 1.76) was much weaker than the effect found for deployment-related stressors (OR, 5.56 comparing top and bottom quartiles).

Another variable that had a strong association with depression was attitudes toward leadership, which had a strong inverse association with depression. Respondents in the highest tertile of the attitudes toward leadership scale (those with the most positive attitudes) had less than half the likelihood of screening positive for depression (OR, 0.44) as those in the lowest tertile. Screening positive for mild TBI was also associated with depression: Marines who screened positive for mild TBI (had at least one mild TBI symptom) were more than twice as likely (OR, 2.10) to be depressed than Marines who did not screen positive for mild TBI.

The only demographic variable that was related to depression in the multivariate model was marital status. Divorced Marines were nearly three and a half times as likely (OR, 3.41) to screen positive for depression as currently married Marines. Never-married Marines were also more likely to be depressed than currently married Marines (OR, 2.17).

Anxiety

Table 3 shows the results of the logistic regression of the demographic and psychosocial variables in relation to anxiety. In the univariate analysis, these variables had significant associations with anxiety: combat exposure, deployment-related stressors, attitudes toward leadership, screening positive for mild TBI, and age.

In the multivariate model, the following variables were significantly associated with anxiety: combat exposure, deployment-related stressors, attitudes toward leadership, and screening positive for mild TBI. As was found for depression, the variable with the strongest association with anxiety was deployment-related stressors. With all other variables controlled, Marines in the highest quartile of deployment-related stressors were nearly five times as likely (OR, 4.92) to screen positive for anxiety as those in the lowest quartile. Although combat exposure was significantly associated with anxiety, this effect was not as strong as that of deployment-related stressors.

Attitudes toward leadership were inversely related to anxiety. Respondents in the highest tertile of the attitudes toward leadership scale (those with the most positive attitudes) had less than half the likelihood (OR, 0.40) of screening positive for anxiety as those in the lowest tertile. Screening positive for mild TBI was also associated with anxiety: Marines who reported at least one mild TBI symptom were nearly twice as likely (OR, 1.91) to screen positive for anxiety as those

TABLE 2. Logistic Regression Analysis of Demographic and Psychosocial Variables in Relation to Depression (Marines Deployed to Combat, 2002–2007)

Variable	Univariate		Multivariate	
	OR	95% CI	OR ^a	95% CI
Combat exposure				
Low (reference)	1.00		1.00	
Medium	1.74**	1.23–2.45	1.40	0.95–2.07
High	1.72**	1.21–2.44	1.30	0.88–1.93
Very high	2.79**	1.99–3.92	1.76**	1.18–2.63
Deployment-related stressors				
Low (reference)	1.00		1.00	
Medium	1.94**	1.27–2.99	1.73*	1.10–2.72
High	3.24**	2.17–4.83	2.71**	1.77–4.16
Very high	7.97**	5.39–11.77	5.56**	3.63–8.52
Attitudes toward leadership				
Low (reference)	1.00		1.00	
Medium	0.45**	0.34–0.59	0.54**	0.39–0.73
High	0.32**	0.24–0.43	0.44**	0.32–0.60
Mild TBI symptoms				
No (reference)	1.00		1.00	
Yes	2.53**	1.85–3.47	2.10**	1.45–3.04
Age (yrs)				
18–21	2.00**	1.50–2.67	0.94	0.60–1.46
22–26	1.67**	1.23–2.27	1.04	0.72–1.52
≥27 (reference)	1.00		1.00	
Education				
High school or less (reference)	1.00		1.00	
Some college/college degree	0.68**	0.54–0.86	0.82	0.62–1.10
Race				
White (reference)	1.00		1.00	
Nonwhite	1.08	0.86–1.36	1.09	0.84–1.42
Marital status				
Married (reference)	1.00		1.00	
Never married	2.05**	1.60–2.62	2.17**	1.57–2.99
Divorced	3.49**	2.30–5.27	3.41**	2.14–5.42
Number of deployments				
One (reference)	1.00		1.00	
Two or more	0.99	0.79–1.24	1.20	0.90–1.59
Active or reserve				
Active (reference)	1.00		1.00	
Reserve	0.95	0.69–1.29	1.06	0.69–1.63
Months since last deployment				
≤5 (reference)	1.00		1.00	
6–14	0.89	0.68–1.17	0.88	0.64–1.21
>14	0.63**	0.48–0.83	0.81	0.54–1.21

^aORs were adjusted for all covariates shown in the table.**p* < 0.05.***p* < 0.01.

OR indicates odds ratio; CI, confidence interval; TBI, traumatic brain injury.

who reported no TBI symptoms. In the multivariate model, none of the demographic variables was significantly related to anxiety.

Because deployment-related stressors were strongly associated with both depression and anxiety, univariate logistic regression was used to examine the individual items on the deployment-related stressor scale in relation to these two disorders. These results are shown in Table 4. Every individual deployment-related stressor was signifi-

cantly associated with both depression and anxiety. The stressors with the strongest associations with depression were difficulty in communicating with home (OR, 3.20), concerns or problems back home (OR, 3.09), lack of privacy or personal space (OR, 2.89), and lack of time off (OR, 2.89). The deployment-related stressors with the strongest associations with anxiety were problems with supervisor(s) or chain of command (OR, 3.30), lack of privacy or personal space

TABLE 3. Logistic Regression Analysis of Demographic and Psychosocial Variables in Relation to Anxiety (Marines Deployed to Combat, 2002–2007)

Variable	Univariate		Multivariate	
	OR	95% CI	OR ^a	95% CI
Combat exposure				
Low (reference)	1.00		1.00	
Medium	1.18	0.68–2.06	0.97	0.54–1.75
High	2.22**	1.35–3.65	1.75*	1.01–3.01
Very high	3.31**	2.04–5.36	2.11**	1.22–3.64
Deployment-related stressors				
Low (reference)	1.00		1.00	
Medium	1.83	0.95–3.51	1.78	0.89–3.57
High	2.77**	1.51–5.08	2.36**	1.22–4.55
Very high	7.22**	4.09–12.75	4.92**	2.61–9.26
Attitudes toward leadership				
Low (reference)	1.00		1.00	
Medium	0.39**	0.26–0.58	0.50**	0.32–0.76
High	0.30**	0.20–0.45	0.40**	0.26–0.63
Mild TBI symptoms				
No (reference)	1.00		1.00	
Yes	2.72**	1.85–4.01	1.91**	1.21–2.96
Age (yrs)				
18–21	1.89**	1.25–2.86	1.51	0.83–2.75
22–26	1.78**	1.15–2.74	1.49	0.90–2.45
≥27 (reference)	1.00		1.00	
Education				
High school or less (reference)	1.00		1.00	
Some college/college degree	0.91	0.66–1.24	1.12	0.76–1.65
Race				
White (reference)	1.00		1.00	
Nonwhite	0.83	0.60–1.14	0.83	0.58–1.18
Marital status				
Married (reference)	1.00		1.00	
Never married	1.14	0.81–1.59	1.00	0.66–1.50
Divorced	1.73	1.00–2.99	1.43	0.79–2.61
Number of deployments				
One (reference)	1.00		1.00	
Two or more	1.04	0.76–1.43	1.20	0.83–1.74
Active or reserve				
Active (reference)	1.00		1.00	
Reserve	1.05	0.69–1.60	1.27	0.72–2.22
Months since last deployment				
≤5 (reference)	1.00		1.00	
6–14	0.78	0.53–1.15	0.72	0.47–1.10
>14	0.70	0.48–1.02	0.77	0.45–1.31

^aORs were adjusted for all covariates shown in the table.**p* < 0.05.***p* < 0.01.

OR indicates odds ratio; CI, confidence interval; TBI, traumatic brain injury.

(OR, 2.96), not having the right equipment or parts (OR, 2.84), and boredom or monotony (OR, 2.84).

DISCUSSION

The overall objective of this study was to identify factors associated with depression and anxiety in US Marines who deployed to combat in Iraq and Afghanistan. A specific objective was to examine

deployment-related stressors in relation to depression and anxiety, controlling for combat exposure. In a sample of 1560 Marines, 25.8% screened positive for depression and 11.2% screened positive for anxiety.

Eleven demographic and psychosocial factors were examined in relation to depression and anxiety. In the multivariate model, five factors emerged as significant in relation to depression: deployment-related stressors, combat exposure, attitudes toward leadership, screening

TABLE 4. Univariate Logistic Regression Analysis of Deployment-Related Stressor Scale Items in Relation to Depression and Anxiety (Marines Deployed to Combat, 2002–2007)

Deployment-Related Stressor ^a	Depression		Anxiety	
	OR	95% CI	OR	95% CI
Uncertain redeployment date	2.19	1.65–2.91	2.39	1.67–3.42
Long deployment length	2.24	1.75–2.93	2.23	1.58–3.16
Feeling homesick	2.23	1.73–2.87	2.07	1.48–2.89
Lack of privacy or personal space	2.89	2.26–3.70	2.96	2.14–4.08
Boredom or monotony	2.42	1.91–3.06	2.84	2.06–3.90
Concerns or problems back home	3.09	2.41–3.97	2.77	2.00–3.83
Problems with supervisor(s) or chain of command	2.71	2.07–3.55	3.30	2.35–4.62
Lack of time off	2.89	2.26–3.69	2.77	2.01–3.82
Heat and/or cold	2.36	1.87–2.99	2.41	1.76–3.32
Not having right equipment or parts	2.56	1.98–3.31	2.84	2.04–3.95
Difficulty in communicating with home	3.20	2.40–4.27	2.68	1.87–3.85

All ORs in the table are significant ($p < 0.01$).

^aRespondents were asked “how much personal trouble or concern” was caused by each deployment stressor. Responses of very low, low, and medium were categorized as low concern (0); responses of high and very high were categorized as high concern (1). The logistic regression compared low and high concern responses.

OR indicates odds ratio; CI, confidence interval.

positive for mild TBI, and marital status. The same set of factors was significant in relation to anxiety, except that marital status was not significant.

Of all the variables in the study, deployment-related stressors had the strongest association with both depression and anxiety. In fact, deployment-related stressors were more strongly linked with both mental health outcomes than was combat exposure. In addition, we found a significant association of deployment-related stressors with depression and anxiety when the effects of combat exposure were controlled. This is a finding that we have not seen in any previous research.

Our finding of an association between deployment-related stressors and depression and anxiety is consistent with past research that has found a link between deployment-related stressors and PTSD (Bartone et al., 1998; Engelhard and van den Hout, 2007; Fontana and Rosenheck, 1999; Vogt et al., 2005). In addition, our results are consistent with the idea that stressors related to deployment but unrelated to combat may have an important impact on the mental health of military personnel (Engelhard and van den Hout, 2007; King et al., 1995).

An implication of these findings is that because deployment-related stressors are potentially modifiable, the military may be able to address them in concrete ways, such as by improving support to families back home, access and options for communicating with home, and leadership; providing combatants with more time off while in theater; and providing them with more equipment and supplies. Making these changes could substantially reduce stress and improve the quality of life of deployed military service members.

There were substantial associations between combat exposure and both depression and anxiety. This finding is consistent with past studies showing a link between combat exposure and mental health outcomes (Hoge et al., 2004; Sareen et al., 2007; Wells et al., 2010). The most important aspect of our results was that deployment-related stressors had a much stronger association with both depression and anxiety than did combat exposure. However, some previous research has obtained similar results (Fikretoglu et al., 2006; King et al., 1995).

One way to conceptualize the effects of deployment-related stressors on combatant mental health is to view them as comparable to “daily hassles.” Daily hassles are minor stressors that occur in the course of day-to-day living; examples include problems with co-workers, having too many responsibilities, and concerns about the

health of a family member. Once it was established that stressful life events have an adverse impact on mental health, a number of studies found that daily hassles also have a substantial negative impact on mental health (e.g., DeLongis et al., 1988; Kanner et al., 1981). Some studies found that daily hassles had a stronger impact on mental health than did stressful life events (e.g., DuBois et al., 1992; Kanner et al., 1981). This could be because daily hassles occur more frequently than stressful life events and affect a larger proportion of individuals. Just as daily hassles and minor stressors seem to substantially impact the mental health of civilians, daily hassles and minor stressors in deployment settings may substantially impact the mental health of deployed military personnel.

Although our study’s findings regarding deployment-related stressors is interesting, it needs to be interpreted cautiously because of the cross-sectional nature of our data. It is possible that the Marines’ level of neuroticism, the state of their mental health, or other previous vulnerabilities could have affected their reporting of deployment-related stressors. A study relevant to this issue (Engelhard and van den Hout, 2007) found that the strength of the association between deployment stressors and PTSD symptoms was reduced by 31% after statistical control for neuroticism. Prospective studies will be needed to untangle the associations between deployment stressors and mental health.

Our finding that screening positive for mild TBI was significantly associated with depression and anxiety is consistent with other recent military studies demonstrating overlap between mild TBI and mental health conditions (Carlson et al., 2010; Hoge et al., 2008; Schneiderman et al., 2008). However, the cross-sectional nature of our data did not allow us to draw any conclusions regarding the direction of causality between symptoms of mild TBI and depression and anxiety.

Our finding that married Marines were substantially less likely to be depressed than divorced or never-married Marines is consistent with past military (Fiedler et al., 2006; Lapierre et al., 2007) as well as civilian (Simon, 2002) research linking being married with better mental health.

The hypothesis that rates of depression and anxiety would be higher for reserve than for active-duty personnel was not supported. However, it should be noted that more than 90% of the reservists in our sample deployed with the unit that they had drilled and trained with on a routine basis, and not as individual augmentees, who deploy

alone to other units. Because they trained together on a monthly basis both before and after deployment, most reservists in our sample had the opportunity to maintain social ties with the individuals with whom they deployed. This may have had a beneficial effect on their mental health. Reservists who deploy as individuals may have higher rates of mental health problems.

This study found that positive attitudes toward leadership were strongly protective against both depression and anxiety. Analyses of specific deployment-related stressors also supported this finding because “problems with supervisor(s) or chain of command” had a substantial association with depression and anxiety. Although it is widely believed that good leadership is important in combat situations and has a strong impact on morale (Griffith, 1988), little research has systematically studied the effects of military leadership on mental health. Longitudinal research is needed to further define the effects of leadership on the mental health of deployed service members.

This study had a number of important limitations. Data were collected at a single point in time, which precludes drawing conclusions about cause and effect. In addition, all study data were based on self-report, with its associated limitations (e.g., socially desirable responding, recall bias). Self-reports of deployment-related stressors could have been affected by respondents’ levels of psychological distress or a personality trait such as neuroticism. Other preexisting characteristics of the participants could have also affected their reporting of, or sensitivity to, deployment-related stressors. Another limitation is that the surveys from which we drew our data asked for identifying information. Although confidentiality of responses was emphasized, some degree of underreporting may have occurred.

CONCLUSIONS

This study found that deployment-related stressors are more strongly linked with anxiety and depression than any other factor, including combat exposure. Moreover, deployment-related stressors are significantly associated with anxiety and depression when the effects of combat exposure were controlled. Because deployment-related stressors are potentially modifiable, this finding could be translated into changes made by the military. Additional research will be needed to clarify the nature and impact of deployment-related stressors on service members.

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